

MOBILE SATELLITE COMMUNICATIONS IN THE FOREST SERVICE

JOHN R. WARREN, Advanced Electronics Group, United States Forest Service,
Department of Agriculture, United States.

UNITED STATES FOREST SERVICE
Boise Interagency Fire Center
3905 Vista Avenue
Boise, Idaho 83705

ABSTRACT

The USDA Forest Service manages 191 million acres of public-owned land in the 156 National Forests of the nation. Much of this land is in remote locations with poor or no commercial communication services. Normally, communications from Ranger stations are handled by the telephone companies. For working communications, a Forest usually has base stations and repeaters which cover a large part of the area. Mobile radios are used in land vehicles as well as aircraft and can usually maintain contact directly or via a repeater. Handheld radios are also used. There are usually some places within a Forest that do not have adequate coverage due to line-of-sight or other reasons. These areas are generally known by the foresters and radio technicians and allowances made for that when working or traveling in those areas. However, when wildfire or other emergencies occur, communications are vital because wildfires can require hundreds of firefighters and cover thousands of acres. During these emergency operations the existing communications are not adequate and complete radio systems are moved into the area for the conduct of fire communications. Incident Command Posts (ICP's) and Fire Camps are set up in remote locations and there is constant need for communications in the fire area and to agency headquarters and dispatch offices. Mobile satellite communications would be an ideal supplement to the Forest Service's current communications system in aiding forest fire control activities.

FIRE COMMUNICATIONS

The Department of Agriculture (Forest Service) and the Department of Interior spend an average of \$220,000,000 annually in the suppression of wildland fires. The number of personnel of a large fire may vary from 300 to over 2000. Due to the hazards and logistical complexities associated

with large wildland fire management, it is essential that adequate communications are available. Fire Camps and ICP's are often located in remote areas. It is necessary to provide eating, sleeping, and sanitation arrangements, as well as transportation of people, equipment, and supplies often during rapidly changing situations.

Communications at the fire scene are accomplished with VHF/UHF radio systems which include base stations, portable repeaters, mobiles, and hand-held radios. These are set up quickly and operated efficiently by skilled communications technicians. Communications means to agency headquarters and dispatch centers vary widely, depending on the locations and what means can be made available. Often there are no telephone lines available to the ICP. Portable repeaters may permit some radio communications after they can be installed and activated if they can be tied in with the outside locations. However, sometimes this may not be timely or even possible because of line-of-sight, distance, repeater location accessibility and other reasons. During the past few years satellite communications from some of these remote locations have been used successfully. Very Small Aperture Terminals (VSAT's) which are transportable are available and can be used.

The Forest Service is starting to use computers and digital data transmission systems at the ICP locations to facilitate resource ordering, reporting, recordkeeping, timekeeping, resource status, situation status, data base access, etc. Traditionally, all communications were conducted by voice. Computers and data systems are now used routinely throughout the Forest Service. The use of data transmissions within the ICP and to the externally located agency offices can expedite messages, avoid misunderstandings or incorrect copying of orders, and improve the effectiveness and efficiency of the operations. Interagency studies are being completed and field testing planned to determine the extent to which data transmission should be accomplished.

Mobile satellite communications would provide a means for providing communications during the early stages of the operations and even while the fire staff personnel are enroute to the scene. Any of the currently available communications means requires time to set-up, check, and become operational. Mobile satellite communications would be ideal during that interim time. They would also be an ideal supplement to existing "cached" communications systems for those extra-ordinary years when the number and extent of wildfires simply overwhelm the normally available systems. The mobile-sat equipment could also be used in normal years for smaller fires or in areas where setting up the more complex systems might not be appropriate. Mobile-sat equipment should also be useful during the final phase-down operations. This would permit the larger systems to be removed and transported to other locations without isolating the remaining mop-up crews.

AIRBORNE COMMUNICATIONS

The Forest Service also uses airborne infrared systems to locate and "map" wildfires and also to detect newly started lightning or other fires. When those fires can be geo-referenced on board the aircraft, the fire

perimeter and hot spot locations could be transmitted to the ground in latitude and longitude coordinates. This could be done without a mobile satellite system but that requires the aircraft to establish a line-of-sight RF link with the ground receiving site and retain it until all the data are transmitted. In the typical rugged terrain that can be a time-consuming task that subtracts from the available airborne time, requires the aircraft to deviate from the best route to the next destination, may interfere with other airborne operations, and uses a frequency which may be in short supply. The use of a mobile satellite link on the aircraft would permit transmission of the fire data from virtually any location while the plane is proceeding to the next destination.

ROUTINE COMMUNICATIONS

Finally, for normal routine operations there are some areas which are not covered by the Forests' VHF radio system but where personnel must conduct activities from time to time. The mobile satellite system would be ideally suited to provide communications for those areas. That could also perhaps eliminate the expense and upkeep of selected repeater sites on a planned basis where sites are maintained primarily for occasional coverage of areas to determine if the use of mobile satellite communications would be less expensive than existing Forest radio communications. It is likely that when the capability is available and used there will be a number of other applications that will be identified.